CASE REPORTS

COTTON-WOOL GRANULOMA OF PULMONARY ARTERY

BY

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We have recently examined a lung biopsy from a woman with congenital heart disease in which there was a peculiar change in structure of a muscular pulmonary artery unlike the appearances usually associated with hæmodynamic disturbance of the pulmonary circulation. Although this vascular lesion has been described before, it is still not familiar to many pathologists to whom it may, therefore, present a problem in the interpretation of lung biopsies. Its occurrence is also probably not widely known by clinicians who may unwittingly cause the lesion in question. For these reasons we thought it worth while to report this case.

Case Report

A housewife, aged 49 years, was admitted to the Thoracic Surgical Unit, King Edward VII hospital, Hertford Hill. on November 25, 1960. Heart disease had been found at the age of 23 following an attack of

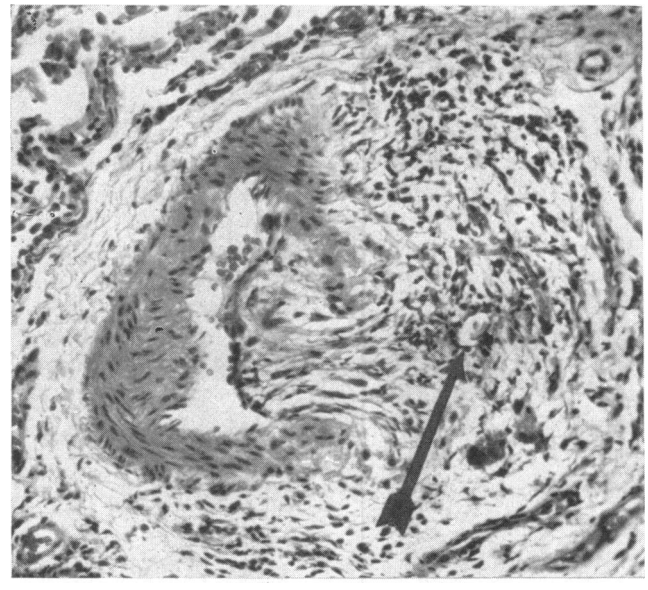

FIG. 1.—Transverse section of a muscular pulmonary artery showing medial hypertrophy. The wall is breached by a granuloma which protrudes into the lumen and also outwards into the adventitia. Note the foreign-body giant-cells in the lower right of the picture. Part of a doubly refractile body is indicated by the black arrow. (Hæmatoxylin and eosin: × 150).

breathlessness. In 1950 her only pregnancy, which terminated successfully in the birth of a live child, was complicated by breathlessness and œdema of both feet and legs. At this time she was told that operation for her heart condition was not advisable. From 1953 onwards she suffered from increasing exertional breathlessness and for the twelve months before admission she had intermittent swelling of both feet. For six months she suffered from attacks of nocturnal breathlessness.

On examination she was acyanotic and had no clubbing of the fingers or toes. She had frequent extrasystoles. The systemic blood pressure was 170/60 mm. Hg. The form of the cardiac impulse, which was palpable almost to the left anterior axillary line, suggested enlargement of both ventricles but predominantly of the left. A systolic murmur was audible over the whole præcordium, maximal in the second left intercostal space where there was also a soft diminuendo diastolic murmur. Râles were heard at both bases. The electrocardiogram showed the patterns of left ventricular enlargement. An X-ray of the chest showed a large heart due to enlargement of both ventricles but predominantly the left; the pulmonary conus was enlarged and the vascularity of the lung fields was increased. A clinical diagnosis of an aorto-pulmonary communication with pulmonary hypertension and left ventricular failure was made, and it was felt that there was still a considerable shunt from left to right. This diagnosis was confirmed by cardiac catheterization which showed a much elevated pulmonary arterial pressure of 80/45 mm. and a calculated left-to-right shunt of 9·0 l./min. Brachial and femoral arterial blood was fully saturated indicating that there was no appreciable right-to-left shunt through the communication.

At thoracotomy on January 3, 1961 a large patent ductus arteriosus was isolated and ligated after temporary clamping. Following ligation an immediate drop in pulmonary arterial pressure and a rise in aortic pressure occurred. Before closure of the chest a small accessory lobe attached to the lingula was removed for histological examination. Following operation the patient made an uninterrupted recovery and was discharged from hospital on January 24, 1961. She has remained well since with considerable improvement in her exercise tolerance.

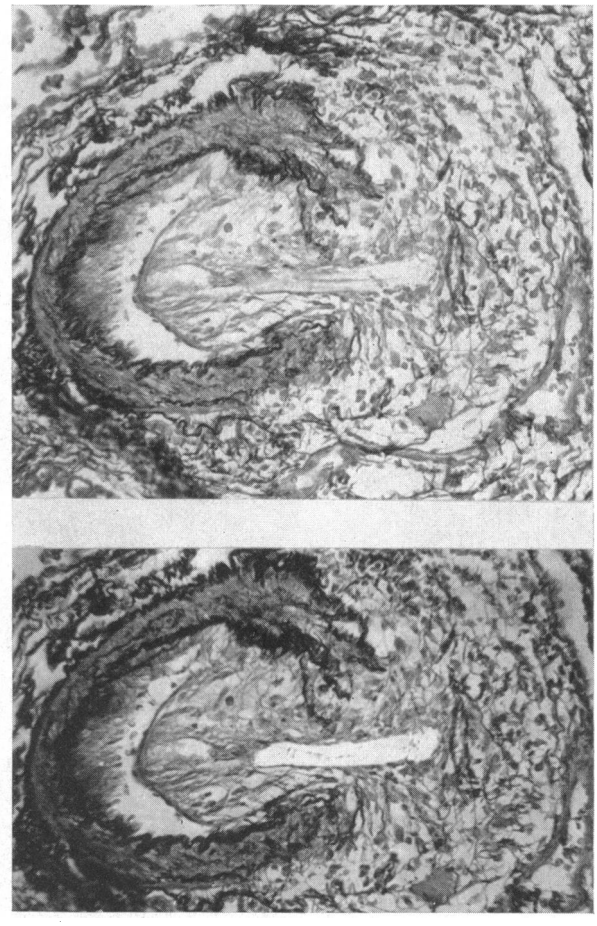

FIG. 2.—(A) Transverse section of the same vessel stained to demonstrate elastic tissue. A rod-shaped cotton wool fibre with a surrounding granulomatous reaction can be seen. The breach in the media and the frayed ends of the internal and external elastic laminæ of the artery are clearly visible. (Elastic/Van Gieson: ×150). (B) The same section photographed in polarized light. The doubly refractile cotton-wool fibre is now seen easily. (Elastic/Van Gieson, in polarized light: ×150.)

Lung Biopsy. One of the muscular pulmonary arteries in the biopsy showed a peculiar change. The affected vessel was about 300μ in diameter. The media was hypertrophied but breached over a distance of about 100μ by a granuloma, which protruded outwards into the adventitia and inwards into the lumen of the vessel. The granuloma was composed of fibrous tissue and scattered chronic inflammatory cells (Fig. 1). It had formed around a rod-shaped body the long axis of which was radial in relation to the artery and which appeared to have penetrated the arterial wall from within outwards. This body was scarcely visible as a pale green amorphous mass in sections stained with hæmatoxylin and eosin and when examined with ordinary illumination it could have been easily overlooked. Grouped around it were a few foreign-body giant-cells. In polarized light it proved to be brightly doubly refractile and stood out prominently (Fig. 2B). Sections stained to demonstrate elastic tissue revealed clearly the breach in the media and its enclosing elastic laminæ which appeared frayed at the edges of the granuloma (Fig. 2A). The remainder of the small pulmonary

blood vessels in the biopsy showed the changes of grade 3 hypertensive pulmonary vascular disease (Heath and Edwards, 1958).

Discussion

The arterial lesion in the biopsy is identical with those described in man and experimental animals as being produced by impaction of cotton wool fibres and subsequent granuloma formation around them (von Glahn and Hall, 1949; Konwaler, 1950; Jaques and Mariscal, 1951). It is well known that the pulmonary blood vessels are freed from a variety of impacted foreign bodies by the formation around these emboli of granulomas which are then extruded through the arterial wall (Harrison, 1948) with loss of continuity of the media and fracture of the elastic laminæ.

Obviously the fragments of cotton-wool fibres reach the pulmonary arteries after they have been inadvertently injected into systemic veins. It seems likely that they are most commonly introduced during intravenous injections when they are stuck onto the tip of the syringe needle. The needle may come into contact with the cotton wool either in a sterile container or actually on the skin where fragments may remain following the classical pre-injection procedure of "sterilization." Cardiac catheterization offers excellent opportunities of introducing cotton-wool fibres into the lung, especially if the tips of the sterile catheters come into close contact with cotton wool during storage. In searching for a cause of the granuloma in the present case we considered our practice of sterilizing cardiac catheters by autoclaving them packed between two layers of thick cotton-wool gauze ("gamgee") placed in circular tins. On inspection of sterile catheters it was found that minute wisps of cotton wool from the gauze became adherent to the tip and to the wall during sterilization. We think it likely that in the present case this may have been the source of the fragments of cotton wool which became detached into the blood stream and were disseminated into the pulmonary circulation during cardiac catheterization. This patient had had no previous intravenous injections. It is a matter of speculation as to how many of this patient's pulmonary arteries may have been affected by cotton-wool granulomas. It would be a surprising coincidence if a solitary lesion in the lung had been resected in the biopsy; a wider dissemination of fibres seems much more likely. However, we are not of the opinion that vascular lesions of this type are of clinical significance. Nevertheless, the method hitherto employed on this unit for the packing of cardiac catheters for sterilization has been discontinued.

Summary

A lung biopsy from a woman with patent ductus arteriosus and associated pulmonary hypertension included a granulomatous reaction in the wall of a muscular pulmonary artery. This granuloma had formed around a cotton-wool fibre which was probably introduced into the pulmonary circulation during cardiac catheterization. Contamination of the catheter most likely occurred during its storage in gamgee tissue.

We wish to thank Mr. R. Abbey-Smith and Dr. E. N. Moyes for allowing us to report this case.

References

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